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"III. That a different exemplar was employed for, at least, the Acts of the Apostles, and possibly others elsewhere; but this is urged on grounds too various and subtle for presentation in a short paper:—and

"IV. That the Latinizing tendency of the manuscript has not been sustained on the grounds alleged."

Mr. J. H. Smith read a paper on the Cross of Kilnasagart.

The Rev. Dr. Lloyd read the concluding part of a paper "on the influence of the moon upon the position of the freely-suspended horizontal magnet."

In a former communication upon this subject the author had analyzed the diurnal range of the magnetic declination in reference to the moon's age, and shown that its magnitude was subject to a periodical variation, being greatest in the first and third quarters of the lunation, and least in the second and fourth. The moon, therefore, conspires with the sun in its effect upon the diurnal range in the former portions of the lunation, and opposes it in the latter.

The preceding method of examination, however, only determines the *total amount* of the effect produced by the moon's action upon the freely-suspended magnet in the course of the day. In order to investigate its *law*, we must examine the varying position of the magnet at the several hours of observation in reference to the moon's hour-angle. To this question the author now proceeded.

The observations discussed are those of the years 1841, 1842, and 1843, during which they were made at intervals of two hours. The results are tabulated according to the moon's hour-angle in the following manner:

The scale-readings of the instrument nearest to the moon's upper meridian passage, on each day, are entered in the first column of the Table; the next following in the se-

cond; and so on to the twelfth. This is continued until the lunation is completed; so that the same solar hour falls on each of the lunar hours in succession, and thus the diurnal variation due to the sun is completely eliminated in the monthly means.

As the lunar day exceeds the solar by $0^{h}\cdot8$, or by four hours in five days, there will be thirteen observations in two out of every five lunar days. In all such cases the observation at 1 A. M., being the first of the solar day, is omitted. There are thus *twelve observations omitted in each lunation*, one between each pair of successive lunar hours in the Table; and it will be easily seen that the effect of such omission is to alter the mean interval from 2^{h} to $2^{h}\ 4^{m}$, corresponding to 30° of the lunar hour-angle.

On account of the smallness of the periodical variation sought, it is indispensably necessary in this investigation to diminish, as far as possible, the effect of magnetic disturbances, the presence of which would altogether mask the regular change. This has been done, as in the corresponding investigation of the ordinary diurnal variation, by omitting altogether days of disturbance, such days being defined to be those in which the sum of the differences between the several scale-readings, and the monthly means of the corresponding hours, exceeds a certain assumed limit.

The monthly means of the scale-readings, in each lunation of the three years, having been calculated in the manner above described, the results of the twelve lunations in each year are again combined, and their means taken. The following Table contains the differences between the yearly means corresponding to each hour, and the mean yearly mean, reduced to angular value, one division of the scale of the instrument being equal to $0'\cdot7205$. The *positive* numbers correspond to *easterly* deviations, and the *negative* to *westerly*. The numbers in the first column are the lunar hours reckoned from the upper meridian passage, each lunar hour being $1^{h}\ 2^{m}$.

TABLE I.—*Diurnal Variation of the Declination, related to the Moon's Hour-Angle. Yearly Means.*

Hours.	1841.	1842.	1843.	Mean.
0	−0′·36	−0′·20	−0′·23	−0′·26
2	−0·26	−0·15	−0·14	−0·18
4	−0·05	+0·04	+0·14	+0·04
6	+0·57	+0·43	+0·27	+0·42
8	+0·36	+0·32	+0·02	+0·23
10	+0·43	−0·25	−0·43	−0·08
12	−0·45	−0·50	−0·48	−0·48
14	−0·72	−0·38	−0·43	−0·51
16	−0·01	−0·27	+0·06	−0·07
18	+0·06	+0·32	+0·56	+0·31
20	+0·52	+0·42	+0·37	+0·44
22	−0·09	+0·19	+0·23	+0·11

It will be seen from the foregoing Table that the position of the freely-suspended horizontal magnet varies with the moon's hour-angle, the north pole deviating twice to the east, and twice to the west, in the course of the lunar day. The extreme westerly deviations occur about 0 and 13 (lunar) hours, or soon after the moon's meridian passage, above and below; and the extreme easterly about 6½ and 20 hours, or soon after the moon's rising and setting. The mean range, measured from the mean of the two greatest westerly elongations to the intervening easterly, is 0′·82, when the moon is to the east of the meridian, and 0′·80 when the moon is west. The mean range due to the sun's action being 9′·6, the lunar range is to the solar as 1 to 12,—a result which accords very nearly with that before derived from a different analysis of the phenomenon.

A marked difference having been elsewhere obtained between the laws of this phenomenon in summer and in winter, it has been thought necessary to separate the results of the summer and winter lunations: they are given in the two following Tables, of which Table II. contains the mean results for summer, and Table III. those for winter.

TABLE II.—*Diurnal Variation of the Declination related to the Moon's Hour-Angle. Summer Lunations.*

Hours.	1841.	1842.	1843.	Mean.
0	−0′·30	+0′·02	−0′·36	−0′·21
2	−0·10	−0·14	−0·17	−0·14
4	+0·22	+0·20	+0·09	+0·17
6	+0·99	+0·63	+0·08	+0·57
8	+0·55	+0·18	−0·08	+0·22
10	+0·53	−0·22	−0·31	+0·00
12	−0·67	−0·85	−0·40	−0·64
14	−1·18	−0·81	−0·20	−0·73
16	−0·50	−0·38	+0·23	−0·22
18	+0·06	+0·24	+0·64	+0·31
20	+0·40	+0·50	+0·36	+0·42
22	−0·01	+0·66	+0·13	+0·26

TABLE III.—*Diurnal Variation of the Declination related to the Moon's Hour-Angle. Winter Lunations.*

Hours.	1841.	1842.	1843.	Mean.
0	−0′·44	−0′·42	−0′·09	−0′·32
2	−0·43	−0·17	−0·09	−0·23
4	−0·32	−0·12	+0·21	−0·08
6	+0·15	+0·22	+0·46	+0·28
8	+0·17	+0·46	+0·13	+0·25
10	+0·32	−0·27	−0·54	−0·16
12	−0·25	−0·13	−0·54	−0·31
14	−0·27	+0·06	−0·63	−0·28
16	+0·48	−0·15	−0·09	+0·08
18	+0·06	+0·41	+0·48	+0·32
20	+0·64	+0·35	+0·38	+0·46
22	−0.18	−0·27	+0·33	−0·04

It appears from these Tables that the summer and winter lunations exhibit the same law, there being in both cases two maxima and two minima, and their epochs coinciding nearly with those already given for the entire year. There is, indeed, an apparent difference in the magnitude of the range; that of the summer lunations being 0′·89 when the moon is eastward of the meridian, and 1′·04 when westward, while for the winter lunations the corresponding ranges are 0′·78 and 0′60.

The foregoing results agree in their main features with those obtained by Professor Kreil* and Mr. Broun, from the discussion of the Prague and Makerstoun observations. The chief difference is in the winter lunations. In the Prague observations the lunar variation is extremely small in winter, and its law is apparently masked by irregular changes; while at Makerstoun there is but one maximum and one minimum in the winter months, and the magnet deviates but once to the east and once to the west in the course of the day. It seems difficult to reconcile such influences of season with any physical cause.

It now remains to examine the consistency of the foregoing results with those already obtained, on the dependence of the diurnal range of the declination upon the moon's age.

It is obvious that as the periods of the oscillations caused by the sun and moon respectively, in the position of the freely suspended magnet, are different, they will combine in every variety of phase; so that the resultant oscillation will vary with the moon's age in the course of the month. Let the variation of the declination at any hour, caused by the sun and moon respectively, be denoted by Δu and δu; then m and n being the solar hours of greatest and least declination, and p the interval (in hours) between the sun and moon's meridian passage, $m-p$ and $n-p$ will be the corresponding lunar hours, and the resultant range will be

$$\Delta_m u - \Delta_n u + \delta_{m-p} u - \delta_{n-p} u.$$

The values of this quantity are given in the following Table, —in the first column of which are the days of the moon's age; in the second the corresponding hours (p) of the moon's retardation; in the third and fifth the calculated values of

* The author takes this opportunity of stating that, in referring to Professor Kreil's labours on this question in his former communication, he omitted to notice the elaborate memoir, "On the Influence of the Moon on the Magnetic Declination," read to the Imperial Academy of Sciences in Vienna, in 1850, and published within the last year. Had he read that paper before he had written his own, he could not have questioned the sufficiency of the evidence for the lunar action which it contains.

$\delta_{m-p}\, u - \delta_{n-p}\, u$, the variable part of the morning and evening ranges due to the lunar action; and in the fourth and sixth, the total ranges. The seventh column contains the mean of the two latter. The value of $\Delta_m u - \Delta_n u$ is 9'·81, for the range between 7 A. M. and 1 P. M; and 9'·33 for the range between 1 P. M. and 10 P. M.

Table IV.—*Diurnal Range of the Magnetic Declination dependent on Moon's Age.*

Moon's Age.	Retardation.	Morning Range.		Evening Range.		Mean Range.
		Lunar Variation.	Absolute Range.	Lunar Variation.	Absolute Range.	
0d	0h	+0'·67	10'·48	+0'·15	9'·48	9'·98
1	1	+0·68	10·49	+0·33	9·66	10·08
2	2	+0·46	10·27	+0·38	9·71	9·99
3	2	+0·30	10·11	+0·38	9·71	9·92
4	3	+0·04	9·85	+0·31	9·64	9·75
5	4	−0·40	9·41	+0·09	9·42	9·42
6	5	−0·77	9·04	−0·17	9·16	9·10
7	6	−0·93	8·88	−0·38	8·95	8·92
8	6	−0·95	8·86	−0·38	8·95	8·90
9	7	−0·84	8·97	−0·39	8·94	8·96
10	8	−0·63	9·18	−0·33	9·00	9·09
11	9	−0·26	9·55	−0·16	9·17	9·36
12	10	+0·25	10·06	+0·07	9·40	9·73
13	10	+0·40	10·21	+0·07	9·40	9·80
14	11	+0·58	10·39	+0·36	9·69	10·04
15	12	+0·76	10·57	+0·64	9·97	10·27
16	13	+0·90	10·71	+0·81	10·14	10·42
17	14	+0·75	10·56	+0·77	10·10	10·33
18	14	+0·60	10·41	+0·77	10·10	10·26
19	15	+0·35	10·16	+0·50	9·83	10·00
20	16	−0·03	9·78	+0·24	9·57	9·68
21	17	−0·31	9·50	−0·08	9·25	9·38
22	18	−0·60	9·21	−0·49	8·84	9·02
23	18	−0·65	9·16	−0·49	8·84	9·00
24	19	−0·65	9·16	−0·75	8·58	8·87
25	20	−0·53	9·28	−0·78	8·55	8·92
26	21	−0·19	9·62	−0·57	8·76	9·19
27	22	+0·19	10·00	−0·40	8·93	9·47
28	22	+0·41	10·22	−0·40	8·93	9·57
29	23	+0·51	10·32	−0·15	9·18	9·75

It will be seen from this Table that the calculated range has two maxima and two minima in the month, the maxima occurring one or two days after syzigies, and the minima one or two days after quadratures. This result agrees very closely with that deduced from a direct examination of the mean ranges, as given in the former communication.

The morning range varies within wider limits than the evening one, the extreme variation of the former being 1′·85, and that of the latter 1′·60; their mean variations are 1′·60 and 1′·20 respectively. This difference is due to the circumstance that the interval between the epochs of greatest and least declination in the former case is six hours, which is also the interval between the maxima and minima of the lunar change; and consequently the lunar variation is doubled in its effect upon the range. In the case of the evening range, on the other hand, the interval of greatest and least declination is nine hours, and they cannot, therefore, both coincide with the extremes of the lunar variation.